

REMARKS/ARGUMENTS

Favorable reconsideration of this application as amended and in light of the following discussion is respectfully requested.

Claims 1-8 and 11-19 are presently active; Claims 20-49 have been withdrawn by a Restriction Requirement; Claims 9 and 10 have been canceled previously without prejudice; and Claim 1 has been presently amended.

In the final Office Action, Claims 1-8 and 13-19 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Jap. Pat. Application Publ. 08-031753 to Tashiro et al in view of U.S. Pub. No. 2003/0151372 to Tsuchiya et al. Claim 12 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Tashiro et al in view of U.S. Pat. No. 5,441,596 to Nulty.

Applicants acknowledge with appreciation the courtesy of Examiner Arancibia to provide an English translation of Tashiro et al. This English translation of Tashiro et al is the document referenced below.

Claim 1 defines a first electrode that receives a first RF signal at a first RF frequency and a second RF signal at a second RF frequency so as to maintain the plasma while the first RF frequency of the first RF source is being changed to the second RF frequency of the first RF source, wherein the first RF frequency used to ignite the plasma is higher in frequency than the second RF frequency used to sustain the plasma.

Applicants submit that this feature patentably defines over Tashiro et al and Tsuchiya et al for at least the following reasons.

Firstly, the Office Action acknowledges on page 3, lines 3-5, that Tashiro et al do not teach the feature of the first RF frequency being greater than the second RF frequency. The Office Action asserts on page 2 that the motivation for modifying the method of Tashiro et al was taught in Tsuchiya et al by their teachings in paragraphs 9-15, which the Office Action

summarizes as to “increase plasma generation efficiency by igniting the plasma with a frequency in the VHF band, but to avoid weakening the sheath electric field by having the frequency too high during processing.”

Yet, this conclusion on motivation appears to disregard those parts of Tashiro et al that show the problems in starting a VHF plasma from a power supply to be used to drive (on the same electrode and thus with the same power supply) a lower frequency RF plasma. In Tashiro et al, it is stated at paragraphs [0015] – [0016]:

If the frequency is about 13.56 MHz, the stray capacitance and the stray inductance are negligible, compared with $L/4$ and C_2 of the matching unit, however the frequency rises to a VHF region, the stray capacitance and the stray inductance cannot be ignored. In other words, if only the matching unit is employed, ***matching is difficult due to the stray capacitance and the stray inductance***. In an actual VHF discharge, if condition (2) was met, the discharge start was very difficult. Furthermore, even if the discharge was carried out, the matching was difficult to be attained, and time was required for the matching.

For these problems, the discharge has been started by increasing the input power, and while attaining the matching, the power has been set to a prescribed value. However, in this method, ***the overload to the power source*** becomes a problem and there has been a limitation in the realization. Furthermore, since the film formation rate is vary fast, if ***the time required until a stable discharge through the matching after the start of the discharge is long***, a film is deposited in the meantime, so that a uniform film has not been able to be formed or at least the initial film has been nonuniform. This is ***a big problem*** for manufacturing apparatuses in which the interface is an important requirement. [Emphasis added.]

In Tashiro et al, it is later stated at paragraph [0019]:

In order to achieve the above-mentioned purpose, the present invention provides a VHF plasma treatment method characterized by the act that . . . a plasma is generated by a high frequency lower than the high frequency being used during the treatment and switched to a plasma with a prescribed VHF high frequency.

Given the power equipment problems disclosed in Tashiro et al when igniting a plasma at VHF frequencies and their solution to start the plasma at lower frequencies and sustain at higher frequencies, Applicants submit that one of ordinary skill in the art (although having knowledge of the benefits to be gained from the teachings of Tsuchiya et al regarding the use of

dual frequency plasma processing by *separate power supplies* and *separate electrodes*) would *not* have been motivated to use a single powered electrode for high frequency plasma igniting and lower frequency plasma sustaining, as claimed.

In other words, the practical power supply problems disclosed by Tashiro et al outweigh any potential benefit of VHF and then RF operation (asserted in the Office Action) which *may or may not* transfer from the dual electrode separate power supply teachings of Tsuchiya et al to the single electrode, single power supply embodiment of Tashiro et al. Indeed, Tashiro et al later disclosed at paragraph [0063] a solution for a VHF discharge start, **but** that solution involves different electrodes for VHF and RF discharges. Thus, for all these reasons, one of ordinary skill in the art at the time of the present invention would not have been motivated to ignite on a single electrode a plasma at higher frequencies than used to maintain the plasma, as claimed.

Secondly, the Office Action in its “Response to Arguments” states that:

It is the teachings of Tsuchiya et al. that would have motivated one of ordinary skill in the art to make the modifications of the method of Tashiro et al. as discusses in the rejection above, with a reasonable expectation of success in attaining the benefits taught by Tsuchiya et al. and discussed above. Moreover, just because a reference teaches a different way of attaining a desired result, even what the reference considers to be the best way of attaining the result, does not mean that the reference teaches away from any other way of attaining the desired result.

The examiner’s attention is invited to In re Gurley, 31 USPQ2d 1130 (Fed. Cir. 1994), which stated that:

A reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or *would be led in a direction divergent from the path that was taken by the applicant*. The degree of teaching away will of course depend on the particular facts; in general, a reference will teach away if it suggests that the line of development flowing from the reference's disclosure is unlikely to be productive of the result sought by the applicant. [emphasis added]

Applicant submits that the teachings of Tashiro et al (which in the embodiment relied on in the Office Action for a powered dual-frequency electrode teach *the opposite* of that claimed by Applicant, which in numbered paragraphs [0015] – [0019] disclaim the use of VHF frequencies to start a plasma with a common electrode, and which in numbered paragraph [0063] show a VHF plasma start operation utilizing different electrodes for VHF and RF discharges) would lead one of ordinary skill in the art in a *direction divergent* from the path that was taken by the applicant.

Hence, Tashiro et al *teach away* from the claimed invention.

Thirdly, M.P.E.P. § 2145 indicates that it is improper to combine references where references teach away from their combination.

In this present combination rejection, Tsuchiya et al apply RF signals from separate RF sources to separate electrodes. In Tsuchiya et al, RF source 50 is applied to the substrate stage and RF source 4 is applied to an electrode separate from the substrate stage. This aspect of Tsuchiya et al teaches away from the single powered dual-frequency electrode of Tashiro et al, relied on in the Office Action for the combination rejection.

Furthermore, the protective circuits described in numbered paragraph [0058] of Tsuchiya et al would likely not provide protection at two different frequencies, as merely starting both power sources in Tsuchiya et al at the same time on two different electrodes creates a “critical error” as explained therein. This critical error problem combined with the disclosure in Tashiro et al of overloading problems when igniting VHF plasmas teaches away from either Tashiro et al or Tsuchiya et al being capable of driving a single electrode with a dual frequency supply that ignites the plasma at VHF and maintains the plasma.

In other words, the matching elements 41 and 51 in Tsuchiya et al are each respectively designed for VHF and HF frequency operations and are not designed to operate in a transient

from VHF to HF frequency operation. Indeed, numbered paragraph [0015] in Tashiro et al explicitly discloses the stray capacitance and the stray inductance problems experienced when 13.56 MHz matching supply has to work at higher frequencies and discloses the overloading problems upon the power supply. Accordingly, a mere rearrangement of matching components (as would be permitted under an obviousness rejection) between the matching components of Tashiro et al and Tsuchiya et al would **not** result in a matching network suitable for the claimed invention, as all the disclosed matching networks are deficient.

Thus, for all these reasons, it is respectfully submitted that Claim 1 and the claims dependent therefrom patentably define over Tashiro et al and Tsuchiya et al.

Lastly, this amendment is submitted in accordance with 37 C.F.R. §1.116 which after final rejection permits entering of amendments canceling claims, complying with any requirement of form expressly set forth in a previous Office Action, presenting rejected claims in better form for consideration on appeal, or presenting amendments touching on the merits upon a showing of good and sufficient reasons why the amendment is necessary and was not presented earlier. The present amendment provides a clarifying change to Claim 1. The present amendment, especially in light of the recently supplied English translation of Tashiro et al, provides specific arguments as to why the 35 U.S.C. § 103(a) rejection is improper and the presently pending claims are in condition for allowance. No new matter has been added, and this amendment does not raise new issues requiring further consideration and/or search. It is therefore respectfully requested that the present amendment be entered under 37 C.F.R. §1.116, and this case passed to issuance.

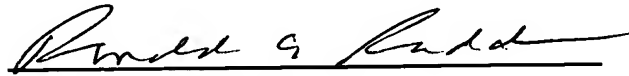
Application No. 10/673,514

Reply to Office Action of December 29, 2006

Consequently, in view of the present amendments and in light of the above discussions, the outstanding grounds for rejection are believed to have been overcome. The application as amended is believed to be in condition for formal allowance. An early and favorable action to that effect is respectfully requested.

Respectfully submitted,

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